



Scale Insects & Their Relatives

O & T Guide [O-#07]

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For most of their lives, scale insects look like anything other than insects. Some are fairly flat while others are raised and wart-like; some are well camouflaged on their hosts while others are extremely obvious. Mealybugs are covered with dusty or mealy filaments of wax secreted by glands in their integument. The life cycles of some scales and their relatives are complex, others are fairly simple and a few are still poorly known. Damage potential varies considerably by species.

Scientifically: According to a recent taxonomic reorganization, these insects belong to the Order Hemiptera, Superfamily Coccoidea.

Metamorphosis: Simple

Mouth Parts: Piercing-sucking

Pest Stages: Crawlers, nymphs, female adults of some species

Life Cycle: Egg (may be retained in some species that give live birth) → series of Nymphs of which only the first may be mobile (the “crawler”) → Adult. Females are immobile in some species but mobile in others; males, if known, usually have one pair of wings. Most are very small and very weak fliers, remaining close to their host plant.

Soft scales (Family Coccidae) include the wax and tortoise scales among others. Females in this group are elongate-oval and generally about 1/8 inch long, occasionally more, depending upon species. They are usually convex but sometimes flattened with a hard, smooth integument or a covering of soft wax.

Legs are usually present and the antennae may either be missing or much reduced. Males may be winged or wingless. Brown soft scale, *Coccus hesperidum*, is usually the most common soft scale pest of greenhouse and interior landscape plants in New Mexico. *Parthenolecanium corni*, the European fruit lecanium, and its relatives are reddish-brown to black, crusty and hemispherical with a diameter about the size of a pencil eraser; it attacks twigs on a variety of fruit, nut and shade trees. Cottony maple scale, *Pulvinaria innumerabilis*, is a fairly large (about ¼ inch long) reddish-brown scale whose eggs are laid on maple twigs in a large, cottony mass that protrudes from the end of the scale.

With over 300 species known in the U.S., the family of **armored scales** (Diaspididae) is the largest family of scales, containing some very important pest species. Females are very small and soft-bodied and are concealed under a scale covering that is usually free from the body of the insect underneath. The scale covering is formed by a combination of wax secreted by the insect plus old cast skins and excretions. Female armored scales lack eyes and legs and the antennae are absent or much reduced. Depending upon species, these scales may be circular or elongate, smooth or rough, and colored variously. Male scales usually have covers that are smaller and more elongated than those of females. Adult male armored scales are winged (only one pair of wings) and have well-developed legs and antennae. Reproduction may be with two sexes or parthenogenetic (i.e. females lay their eggs without fertilization from males). Some

species lay eggs under their scales. Others give birth to live young. The first instar young, or crawlers, are active insects that may crawl some distance before they find a suitable site to settle and begin feeding. Crawlers may also be dispersed on the wind or even the feet of birds landing on infested plants. Once the crawlers have settled and inserted their long stylets into the host, they start to lose many of their insect attributes with succeeding molts. Females remain in one spot for the rest of their lives; males emerge, fly around their host looking for females and die soon after mating.

- San Jose scale, *Quadraspidiotus perniciosus*, probably an import from Asia in the late 1800s, is an important pest of orchard and shade trees, as well as numerous shrubs. It is minute and volcano-shaped; females give live birth to crawlers.
- Oystershell scale, *Lepidosaphes ulmi*, is brown and shaped and textured like its namesake. Infesting many varieties of orchard and shade trees, it can be lethal to aspens in New Mexico. Females lay their overwintering eggs under their scales.
- Euonymus scale, *Unaspis euonymi*, attacks and often kills its host in New Mexico. These scales are easily overlooked initially; the actual scales are tan and minute but the fluted waxy extensions produced by the females eventually give them away.
- Pine needle scale, *Chionaspis pinifoliae*, is an elongated, waxy white scale often found on pine foliage and sometimes other conifers. Although common on some pines in some areas, these usually are heavily parasitized and are minor pests of pine needles.

Kermid or Gall-like Scales (Kermesidae) are most commonly seen on twigs or leaves of oak in New Mexico. Females in this small and poorly known family are rounded, often with

hard or tough scale covers and resemble small galls.

Dactylopid Scales or Cochineal Insects

(Dactylopidae) are pests of *Opuntia* cacti, especially the pad types. Scale colonies are covered by a dense mat of sticky white wax. The actual scales are minute, dark purplish red insects that are broadly oval in form and distinctly segmented.

Pinyon Needle Scales (Margarodidae) are common pests of New Mexico pinyon, both in forests and cultivated settings. Affected plants may have rather thin foliage clumped near the ends of twigs. Closer examination of the tree, especially in the fall, reveals numerous tiny black “beans” adhering loosely to the needles. In late winter, yellowish, mobile females emerge from these “beans” and begin crawling down the branches and trunk towards the bases of their host plants. They are soon joined by gnat-like winged males of the species that have emerged from some of the other “beans.” After mating, the females lay their eggs into masses of filamentous waxy material that they also produce around the bases of host trees. The crawlers soon hatch and begin the return trip up the host tree where they settle to feed for the rest of their nymphal lives on the new growth needles. One generation occurs annually.

Mealybugs (Eriococcidae) are so named from the mealy or waxy white secretions that cover the bodies of these insects both as immatures and adults. Females of most species have elongate-oval, segmented bodies with functional legs. Some species lay eggs while others give birth to live young. The egg-producers cover their clutches in loose filaments of sticky white wax. Various life stages of mealybugs may be found on virtually any part of their host plants. Several important pest species are common in New Mexico including:

- citrus mealybug, *Planococcus citri*, and long-tailed mealybug, *Pseudococcus longispinus*, are both

- significant pests of greenhouse and interiorscape plants.
- obscure mealybug, *Pseudococcus affinis*, is a widespread pest of both woody and herbaceous plants.

Descriptions of Life Stages:

Eggs: Eggs are usually minute, white, yellow, pink or pale orange for most species. Eggs are found under the female scale in armored scales or in waxy coverings exuded by females of other members of this diverse group of insects. Other species retain their eggs and give live birth to crawlers.

Nymphs: The first instar is called a “crawler” for most insects in this diverse group. Most crawlers are barely visible to the naked eye, segmented, with short antennae, small eyes and three pairs of legs. Their mouthparts are visible but are not used in the crawler stage. Upon settling down on an acceptable site on the host, the crawler inserts its filamentous feeding stylets into host leaves or stems and begins to feed on sap. Shortly afterward, it molts and begins to lose its insect attributes with successive molts. Immature mealybugs remain mobile for the duration of their lives; they also produce powdery or waxy filaments from glands in their integument. Male armored scales usually have smaller, narrower scale coverings than females of their species

Adult: Adult mealybugs look like larger versions of their nymphs, only they are able to reproduce. Any “tails” on the end of the abdomen or filaments on the sides of the body are likely to consist only of wax that is easily damaged; also, this wax will dissolve in alcohol if the insect is collected for identification, leaving the bare bodies of the insects. Similarly, the wax of cochineal insects will dissolve in alcohol, leaving only the dark red bodies of the females and nymphs. Of the scale insects, soft scales have their bodies firmly attached to their scales while armored scales have a generally loose attachment between the soft body and scale covering. Some of these insects are known from female-

only populations. Where males are known, they often lack mouthparts and have only one pair of wings; males are minute and very poor fliers.

Habitat and Hosts: Scale insects and their relatives are well adapted to parasitize their host plants. Most are very well camouflaged; their small size, particularly as crawlers, permits them to squeeze into a variety of places on their hosts, many of which would not be readily visible, let alone accessible to topical pesticide treatments. Some, especially the mealybugs, can occur almost anywhere on the exterior of their hosts, including below-ground plant parts. The kermid scales are the least known biologically and taxonomically of all of the scale insects and relatives mentioned. Many species of soft and armored scales as well as mealybugs have extremely broad host ranges, despite their common names.

Damage: Many species of soft and armored scales produce large amounts of honeydew. Ants, bees, wasps and flies can be attracted to honeydew deposits. In humid conditions, honeydew becomes a substrate for growth of black, sooty mold on foliage. In addition to being unsightly, foliage covered by sooty mold often falls from the plant, diminishing food production by the plant and stressing it to produce regrowth. Usually feeding on the undersides of leaves, small twigs or branches, scale insects can cause yellowing of foliage, leaf drop and twig die-back. Sap loss causes some of these problems while salivary enzymes produced by these feeding pests contribute to tissue damage and growth irregularities. Some, such as San Jose scale, can infest developing fruit, causing irregular ripening and hardening the flesh under the skin. Armored scales feed mainly on perennial shrubs and trees. Large populations can encrust twigs or branches, severely weakening or killing their host plants. Many species of scale insects and their relatives are economically important pests of greenhouse and nursery crops, interiorscape plants, shrubs and a variety of native and imported tree species.

Kermid scales produce the often noticeable and objectionable pea-sized, woody galls on oak twigs. Progressive twig die-back is common with these infestations. Most species and details of their life cycles are poorly known.

Cochineal insects produce very obvious white, cottony colonies that detract from the appearance of their “prickly-pear cacti” host plants. Left alone, these pests weaken the pads, progressively killing the plant.

Pinyon needle scales also can progressively weaken their pinyon hosts to the point that the only needles on the branches are at the very ends and these are densely covered with the black “beans” of the developing pests. The late winter-early spring congregation of adult pinyon needle scales at the base of the plant or in crotches of limbs is unsightly. Large populations of these pests can kill pinyon trees unless treated; they also can stress their hosts, making them more susceptible to infestation by other pests, particularly bark beetles.

Mealybugs are extremely difficult pests to control. Easily transmitted to other hosts by physical contact and overcrowded growing conditions, the pests can be very difficult to find because of their invasive nature, secretive habits and camouflage. They can feed on almost any live part of the plant where the bark or external covering is thin enough to allow penetration of the mouthparts. Eggs may be hidden in the axils of leaves, crevices of branches, rough bark, surface roots or concealing plant parts. In addition they are covered with thick coats of protective wax which resists wetting.

IPM Notes: The insects presented in this fact sheet often are serious pests of various ornamental plants for different reasons.

Cochineal insects and their *Opuntia* cactus hosts are both native to New Mexico and the Southwest; despite their long relationship with each other, the insects can disfigure and kill their hosts, situations not acceptable for cacti

used as landscape ornamentals. Kermid scales and oaks likewise are native to the Southwest. Although they rarely kill their hosts, kermid scales can damage the appearance of specimen landscape oak trees.

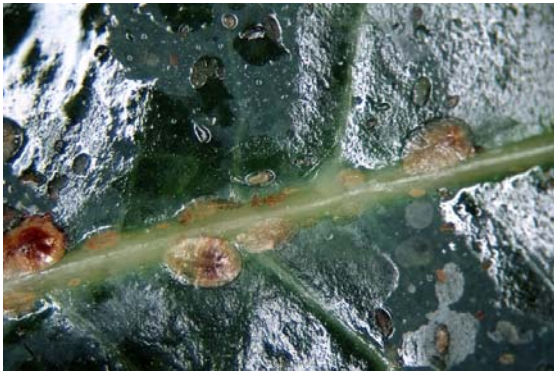
Environmental stresses and some growing practices may favor infestations and outbreaks of scale insects and their relatives. Scales can infest cuttings or recently received plant stock. Crawlers may move to uninfested hosts directly, particularly when plants are crowded. Alternatively, natural wind currents or greenhouse blowers can disperse crawlers from one growing area to another. Constant scouting of new and older plants is required, as is fast action to minimize damage.

Many species of damaging scale insects are not native to New Mexico or the U.S. and have arrived here without their natural enemies. Whether or not effective natural enemies could be identified in the homelands of these pests, safely imported by regulatory authorities and adequately established in this area to control these exotic pests is beyond the scope of this handout; in many cases, these projects are probably too costly to investigate or implement.

Where some biological control agents do help curb populations of various scale insects, certain insecticides or treatment frequencies may foster scale pest outbreaks because they eliminate the effective natural enemies better than they do the pests. Producers and plant managers should be aware of these risks and choose appropriate treatments wisely.

For many infestations of scale insects and their relatives, insecticides may work poorly because of poor timing or because the non-living coverings on the pests protect them from applied toxins. The timing issue is best addressed by scouting for crawlers, a susceptible and unprotected life stage. Use a sheet of white typing or copy paper and a small hand tool like a trowel, short tool handle, tree branch or similar object. Holding the paper under a potentially infested host branch, hit the branch sharply several times;

watch for small particles landing on the paper to start moving. These are likely to be the crawlers. Insecticide applications made when crawlers are active can significantly reduce pest populations and improve plant health; they can break the cycle of damage before a new generation infests host plants. Even better results may come from treatments with labeled systemic insecticides. These products can kill crawlers and young nymphs by ingestion, regardless of where the pests may be hiding and regardless of application methods that may result in less than complete and thorough coverage.



Brown soft scale, *Coccus hesperidum*, adults and nymphs. Photo: Whitney Cranshaw, Colorado State University, www.forestryimages.org



European fruit lecanium, *Parthenolecanium corni*, on oak. Photo: Haruta Ovidiu, University of Oradea, www.forestryimages.org



Cottony maple scale, *Pulvinaria innumerabilis*, on maple twig. Photo: Southern Forest Insect Work Conference Archives, Southern Forest Insect Work Conference, www.forestryimages.org



Close-up of San Jose scale, *Quadraspidiotus perniciosus*, on an apple. Photo: Biologische Bundesanstalt Archives, Germany, www.forestryimages.org



Close-up of oystershell scale, *Lepidosaphes ulmi*. Photo: USDA Forest Service - Rocky Mountain Region Archives, USDA Forest Service, www.forestryimages.org



Close-up of euonymus scale, *Unaspis euonymi*, on euonymus. Photo: Lisa Ames, UGA, www.forestryimages.org



Kermes scale, *Kermes* sp., on white oak. Photo: James Solomon, USDA Forest Service, www.forestryimages.org.



Close-up of the overwintering stage (“black bean”) of pinyon needle scale, *Matsucoccus acalyptus*.



Cochineal scale or Dactylopid scale, *Dactylopus confusus*, on a pricklypear cactus pad. Photo: USDA Forest Service - Ogden Archives, USDA Forest Service, www.forestryimages.org



Pinyon needle scale, *Matsucoccus acalyptus*, on pinyon. Note the “black bean” stages on the older, brown foliage. Photo: Whitney Cranshaw, Colorado State University, www.forestryimages.org



Close-up of a long-tailed mealybug, *Pseudococcus longispinus*. Photo: David Cappaert, www.forestryimages.org

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